

the PCT application as well as certified copies of the other priority documents. These documents will be forwarded to the Office as soon as they are obtained. Claims 7-15 and 13-15 stand rejected under 35 U.S.C. § 112. Claims 1-3 and 7-12 stand rejected under 35 U.S.C. § 103. For the following reasons, the rejections on these bases should be withdrawn.

#### **Rejections under 35 U.S.C. § 112**

The Office has rejected claims 7-15 and 13-15 under 35 U.S.C. § 112. Accordingly applicant has amended these claims as requested. With respect to the objected to use of the term "solved", applicant has determined that the term is unnecessary to the understanding of the claims and accordingly has removed the term. Applicant has amended claims 13-15 to incorporate the language suggested by the Office.

#### **Rejections under 35 U.S.C. § 103**

Claims 1-3 and 7-12 stand rejected under 35 U.S.C. § 103 as being obvious in view of either U.S. Pat. No. 5,863,493 to Achari et al. or U.S. Pat. No. 5,837,191 to Gickler. The Office has stated that Gickler and Achari et al. teach a lead free-solder alloy that incorporates the ranges of Cu and Ni which overlap applicant's claimed ranges of those substances. It is noted, however, that the cited references both teach the use of Ag in the amount of 2-5% (Achari et al.) or 0.05-0.5% (Gickler). Furthermore, Gickler additionally teaches the use of 0.8-1.8% antimony. Accordingly, since the applicant has used open ended claim language, the Office has interpreted the applicant's claims as reading on the alloys disclosed in the cited references. In response, applicant has amended the rejected claims to indicate that applicant's claimed alloy does not include either of these substances, thereby distinguishing applicant's claimed alloy from the alloys taught in the cited reference. With respect to the physical differences between the applicant's claimed alloy and the alloys disclosed in the cited references, the applicant has the following comments.

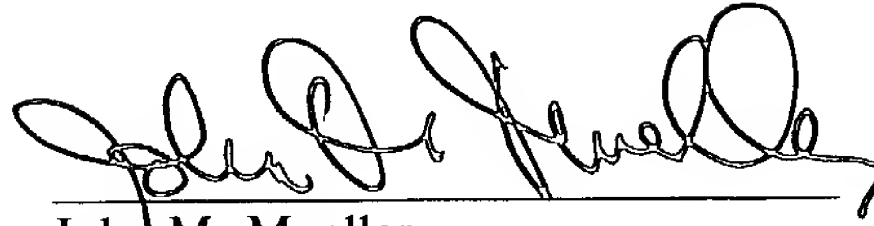
In general, as the Office is aware, each alloy or each compound metal has different physical property when components differ. An alloy of Achari et al. is comprised of

Sn, Ag, Cu, and Ni. The Office has noted that three of these metals are identical to the metals claimed by the applicant. However, considering each wt% of an alloy of Achari et al., the weight % of Ag is 2-5 whereas the wt% of Ni is 0.1-3% . Accordingly, Achari's alloy is mainly an Sn-Ag-Cu solder with the addition of a smaller percentage of Ni.

It is applicant's belief that in the Achari et al. alloy a plurality of inter-metallic compounds form out, that is an Sn-Ag inter-metallic compound, an Sn-Cu inter-metallic compound, and an Sn-Ni inter-metallic compound. In these inter-metallic compounds, since the melting point of Ni is higher than Cu, Sn-Ni coagulates and crystallizes faster than Sn-Cu. As the crystal structure of Sn-Ni and Sn-Cu are likely similar each other, Sn-Cu further crystallizes into the gaps of the crystallized Sn-Ni. This phenomenon makes the size of the Sn-Cu crystal very small and, as a result, the surface of a solder joint made from this alloy would be relatively flat, in any event flatter than an alloy made that contained little or no Ag. This is an undesirable trait in comparison with applicant's claimed silver-less alloy since the inter-metallic compound of Sn-Ag cannot contribute to the smoothness of the surface of solder joint. For this, reason it is not desirable to add Ag to the alloy of applicant's invention and why applicant's invention is patentably distinct from the alloy disclosed in Achari et al. Furthermore, for similar reasons, the addition of Ag and antimony described in Gickler is undesirable in applicant's invention and why applicant's invention is patentably distinct from the alloy disclosed in Gickler.

Accordingly, for the above-identified reasons, it is believed that the application is in condition for allowance and early indication thereof is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John M. Mueller", written over a horizontal line.

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